

Next Generation Space Telescope

# Contamination Control: Outgassing from Sunshield

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## OUTGASSING FROM SUNSHIELD TO OPTICS

**“WORST” CASE SCENARIO ANALYZED**

**ASSUMPTIONS: 25-LAYER MLI USED AS SUNSHIELD MATERIAL**

*affect.)* (The available data set, close but conservative in

**CONSERVATIVE TEMPERATURE SET**  
**SUNSHIELD AT 300K**  
**MIRRORS AT 60K**

**SUNSHIELD UNFURLED 12 HOURS AFTER LAUNCH**

PRIMARY MIRROR DEPOSITION		
MINIMUM	AVERAGE	MAXIMUM
$\sim 1 \text{ \AA}$	$70 \text{ \AA}$	$110 \text{ \AA}$

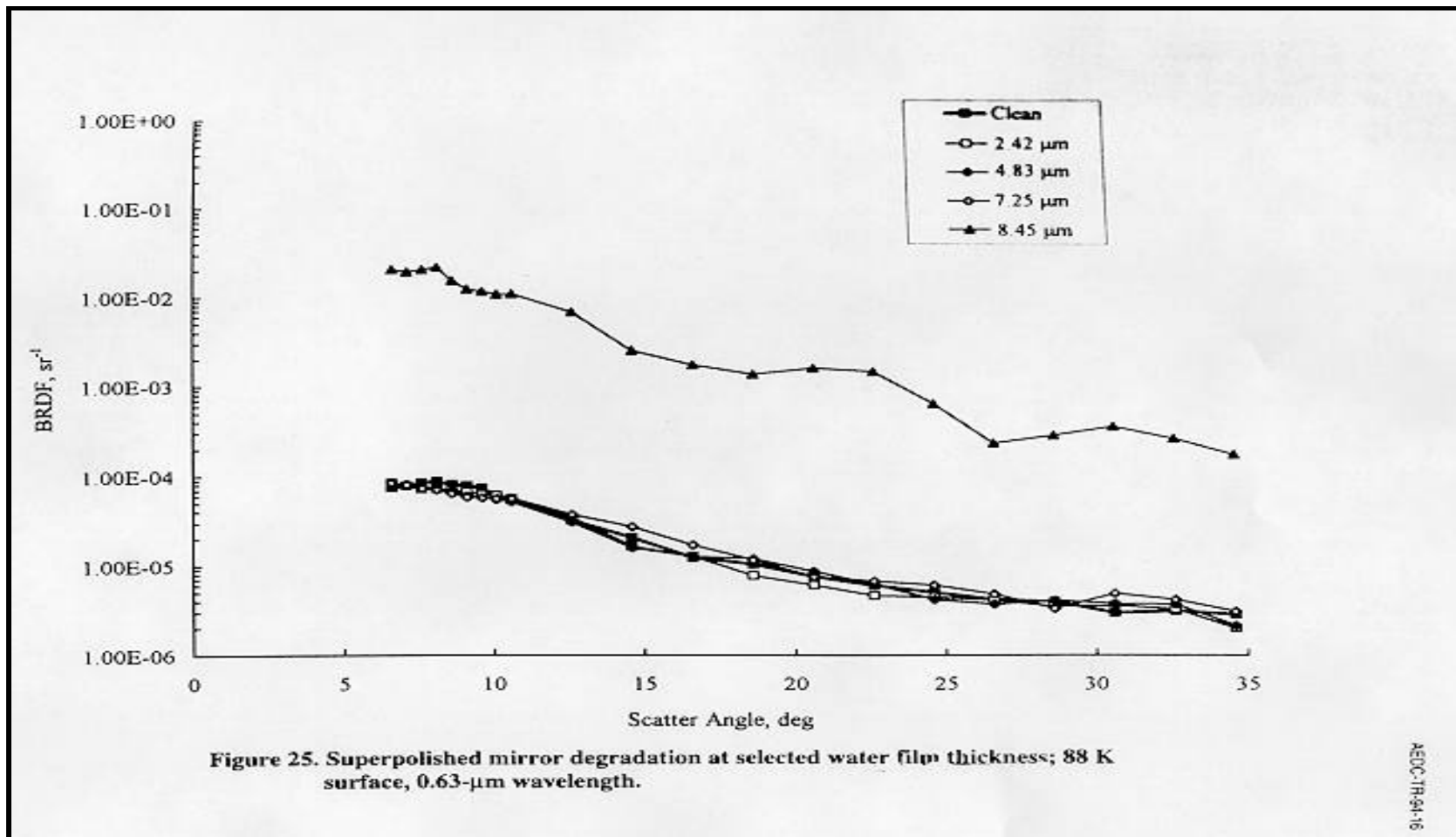
SECONDARY MIRROR DEPOSITION
$465 \text{ \AA}$

## THE CURRENT REALITY

### NEGLIGIBLE POTENTIAL FOR IMPACT ON MIRRORS DUE TO ACCRETION OF WATER

- **SUNSHIELD IS AT 300K FOR <1 HOUR**
- **PRIMARY AND SECONDARY MIRRORS ARE WARMER THAN SUNSHIELD DURING UNFURLING PROCESS**
- **ONCE COLD, SUNSHIELD NO LONGER OUTGASES**  
*(AT 60K, SUNSHIELD CAN BE EXPECTED TO CONTRIBUTE 0.12Å LAYER OF WATER TO THE SUNSHIELD OVER 10 YEARS)*
- **IT WOULD TAKE 8,450Å LAYER OF WATER TO CAUSE AN APPRECIABLE DIFFERENCE IN REFLECTANCE AT 0.63μm AND 10.6μm WAVELENGTHS.**

## EFFECT OF WATER ON REFLECTANCE AT 0.63 $\mu\text{m}$



“CRYOGENIC BRDF MEASUREMENTS AT 10.6 $\mu\text{m}$  AND 0.63 $\mu\text{m}$  ON CONTAMINATED MIRRORS,” PREPARED BY SEIBER, BRYSON, BERTRAND, AND WOOD, CALSPAN CORP/AEDC OPERATIONS, FEBRUARY 1995.

## EFFECT OF WATER ON REFLECTANCE AT 10.6 $\mu\text{m}$

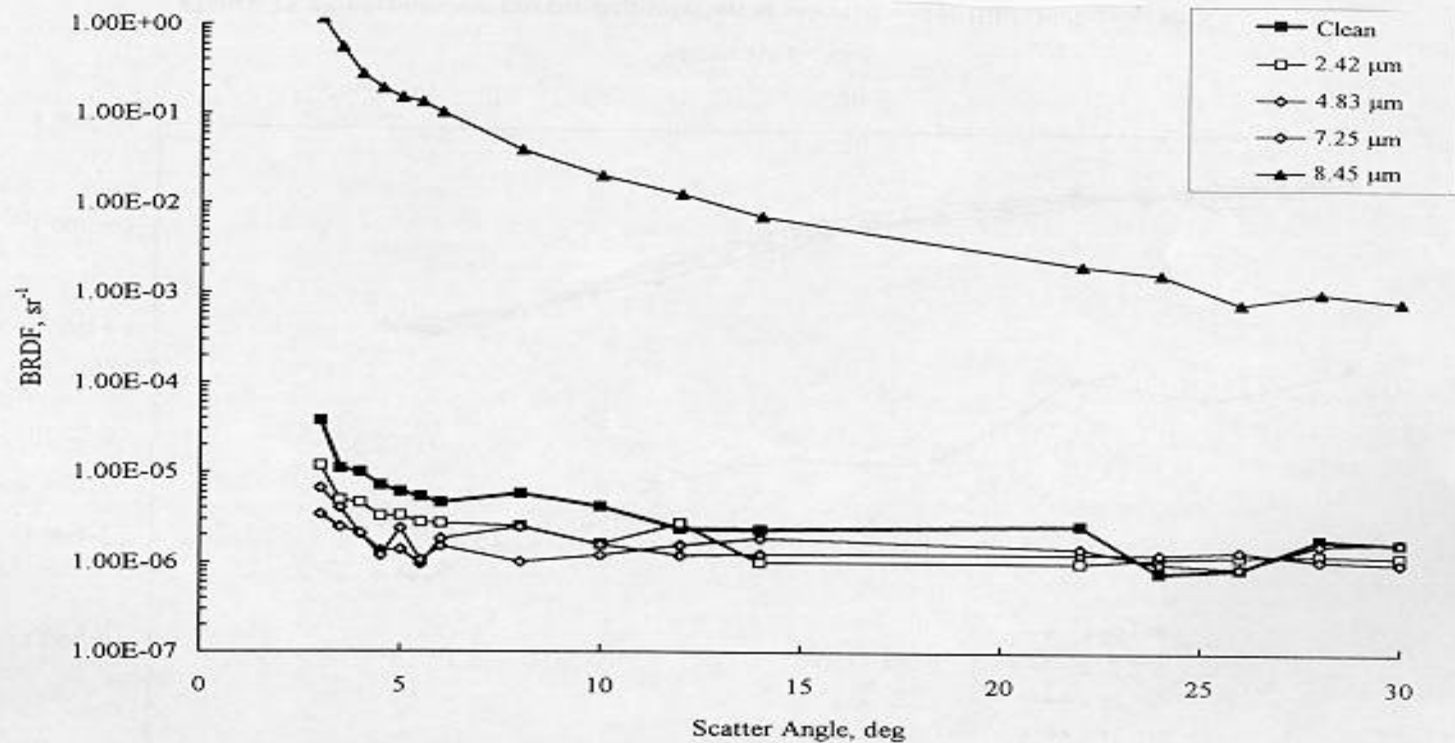


Figure 26. Superpolished mirror degradation at selected water film thickness; 88 K surface, 10.6- $\mu\text{m}$  wavelength.

“CRYOGENIC BRDF MEASUREMENTS AT 10.6 $\mu\text{m}$  AND 0.63 $\mu\text{m}$  ON CONTAMINATED MIRRORS,” PREPARED BY SEIBER, BRYSON, BERTRAND, AND WOOD, CALSPAN CORP/AEDC OPERATIONS, FEBRUARY 1995.

## **ISSUES LEFT TO CONSIDER**

- **ABSORPTION BAND AT  $2.7\mu\text{M}$  -  $5\mu\text{M}$ /EFFECT ON REFLECTANCE**
- **EFFECT ON REFLECTANCE WITH SURFACE AT 60K (vs. 88K)**
- **WILL THE SHIELD EVER WARM UP?**

IF SO ... WHAT WILL THE SHIELD/MIRROR TEMPERATURES BE  
RELATIVE TO EACH OTHER.

- **WILL THE SHIELD BE UNFURLED IN LOW EARTH ATMOSPHERE?**

IF SO ... NEED TO CONSIDER THE EFFECT OF BACKSCATTER.